PREFACE TO THE FRENCH EDITION

THE researches of Professor Groume-Grjimailo bring to us a new idea. Conceptions of this character are very rarely presented to us in the numerous publications of the day, and we sincerely compliment the author in that he has opened the way for us into a very broad field which merits our careful consideration. He has set forth a principle in regard to the circulation of the hot gases within furnaces—a very simple principle, but one that has not heretofore been recognized. We have always considered that gases, by reason of their absolute elasticity, completely fill the chamber in which they are enclosed. Then, by a process of unconscious induction, without any sound basis, we conclude that in circulating through a series of successive chambers or flues, they fill equally the entire cross-section of those chambers through which they pass and that their current sweeps uniformly through all the passages or flues which are open to them in proportion to the area of these passages. Perhaps we should not formulate this erroneous principle in such exact terms; nevertheless, we proceed as though we firmly believed that it was correct. And it certainly follows, notably in the construction of furnaces, that very serious errors are made. Professor Groume-Grjimailo cites numerous examples of these errors.

A phenomenon is more readily understood when it is compared with something that we have always before us. Wo see a stream of water flowing in its bed, resting upon the soil and bounded upon three sides by the surface of the ground. Its upper surface is separated from the atmospheric air above by a horizontal plane, the position of which is not fixed and which varies in accordance with the volume of water flowing. The hot gases in a furnace tend to circulate in exactly the same manner, with

this single difference, that the plane of separation is below, and the profile of the bed of the stream is formed by the roof and the walls of the furnace. As this comparison shows, we have heretofore erroneously considered that the flame filled the entire furnace and heated